Natural Resource Inventory
Town of North Hampton, New Hampshire

Section I

2021









Prepared by the North Hampton Conservation Commission
with support from Rockingham Planning Commission

Autumn Eventide, Little River Salt Marsh
Photograph by Phil Wilson

Cover Photos: North Hampton Conservation Commission (**NHCC**)
Top Row Left: Boulder at Little River Conservancy
Top Row Center: Sunset over the Atlantic Ocean at North Hampton State Beach
Top Row Right: North Hampton Buck Roaming Woods in Afternoon

Middle Row Left: Late Summer Morning at Governor Dale Farm
Middle Row Center: Winter Woods in North Hampton
Middle Row Right: Little River flowing through the Little River Salt March to the Ocean

Bottom Left: October Foliage adjacent to Little River Salt Marsh
Bottom Center: Natural Stone Crossing at Oliver Brook
Bottom Right: Pileated Woodpecker Enjoying a Summer Feast in North Hampton

Town of North Hampton Natural Resource Inventory — 2021

Section I

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Acknowledgements

The North Hampton Conservation Commission extends its gratitude to the community and Town boards and commissions for supporting and contributing to this *Natural Resource Inventory.*

The Commission is especially thankful for natural resource descriptive narratives, data, and maps provided by Jennifer Rowden, *Rockingham Planning Commission Planning Director*.

Thank you to Amanda Stone, *State Specialist, Natural Resource and Land Conservation, UNH Cooperative Extension* for public outreach, guidance and for presenting the *Land Conservation and Water Resource Maps for the Town of North Hampton* created by *The Nature Conservancy.*

This Natural Resource Inventory includes information from the following sources agencies:
The National Oceanic and Atmospheric Administration
The Nature Conservancy
The New Hampshire Coastal Program
The New Hampshire Estuaries Project
The New Hampshire Department of Agriculture, Markets, & Food
The New Hampshire Department of Environmental Services
The New Hampshire Heritage Bureau
The North Hampton Zoning Ordinance
The United States Environmental Protection Agency
The New Hampshire Fish and Game Department
The United States Geological Service

Thank you to the residents of North Hampton for supporting conservation and zoning initiatives to protect the town's natural resources.

Ledge outcropping on Shiprock conservation parcel
NHCC

Letter from North Hampton Conservation Commission

North Hampton is one of four New Hampshire seacoast towns with public beaches that provide direct access to the Atlantic Ocean. Its diverse natural resources comprise rare plant and wildlife known to thrive in its undisturbed acreage and in wetland areas where one-third of the town is classified as wetlands. North Hampton is 14.4 square miles or 9,216 acres.

During the past two decades North Hampton has taken measures to preserve its forests, unique ledge outcroppings, rivers and streams, forested wetlands, meadows, swamplands, salt marshes, and ocean. Since 1964 Town citizens have adopted zoning measures to better protect its wetlands. Approximately 1800 acres of land is conserved of which 900 acres of land is protected within the headwaters of the Winnicut River and Little River Watersheds. Little River Salt marsh restoration projects have been completed during the past 20 years and work is currently underway to begin the process of restoring the Philbrick Pond Salt Marsh.

Preservation and protection of wetlands and water quality and quantity is of paramount importance. Wetlands not only serve as a sponge to filter and clean our water from impervious surface runoff after storms, these valuable wetlands serve as surge tanks to help prevent and alleviate flooding. North Hampton's stratified drift aquifers are crucial local and regional sources of drinking water and its bedrock aquifers have the potential to supply additional amounts of water.

According to the 2008 New Hampshire Estuaries Project *"A Citizen's Guide to Protecting North Hampton's Wetlands and Water Resources"* most watersheds experience severe habitat and water quality degradation when the percentage of impervious cover exceeds 25%.

The population of North Hampton has more than doubled since 1960. In 2008 The New Hampshire Estuaries Project calculated that in North Hampton impervious surface covers 12.4 percent. The most recent 2010 impervious surface calculation rose to 15.3 %, which exceeds the 10% surface area guideline at which level wetlands deterioration begins.

This inventory provides a description of North Hampton's natural resources, steps that have been taken to protect its resources, and recommendations to further protect wetlands and natural resources. Land conservation for water protection maps along with additional land use and topographical maps and charts will help guide boards and commissions for present and future planning and zoning.

The preservation of the North Hampton's natural resources will help ensure a high quality of life for our residents and for generations to come.

Sincerely,

North Hampton Conservation Commission

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Purpose of the Natural Resource Inventory

This Natural Resources Inventory (NRI) provides information to describe important, naturally occurring resources in North Hampton.

This information has been presented to provide resource information for local planning and zoning decisions and to stress the importance of preserving and protecting the North Hampton's finite natural resources.

This Natural Resource will:

- Map and describe significant natural resources in North Hampton;
- Identify areas of high ecological value at the local, regional, and state level;
- Recommend options for the protection and management of natural resources in North Hampton;
- Incorporate relevant reports and studies regarding natural resources in North Hampton into one document.
- Include NRI (narrative and maps) in the Natural Resources chapter of the Master Plan to promote consistency between the NRI and the Master Plan;
- Include "At a Glance" summary of conservation and water resource protection initiatives.

Small steps make a big difference. Efforts to protect natural resources during the past decades help safeguard the Town from flooding during high tides and storms.

Photograph by Kevin Lucey, *NH DES Coastal Program*

This photo on the left depicts "ditching" that occurred in this marsh years ago that increased the amount of open water and marsh sediment while reducing healthy marsh vegetation.

Phase II: Philbrick Pond Salt Marsh Restoration aims to reduce the effects of ditching by creating shallow paths to help drain the marsh and lessen flooding.

1966: The North Hampton Conservation Commission was established pursuant to RSA 36-A for the proper utilization and protection of the natural resources and for the protection of watershed resources.

1974: Minimum lot size increased to 87,000 square feet.

1978: Establishment of Wetlands Conservation District:
Zoning Ordinance Section 501 (Updated from 1979-2020).

1981: Critical and Unique Regulations: Established to protect areas identified on the Natural Resource Map having severe limitations to development or that are unique to the Town of North Hampton or the State of New Hampshire:
Zoning Ordinane Section 601.1.

1993: Natural Resource Inventory prepared by the Rockingham Planning Commission.

1999: Little River Salt Marsh Restoration Plan and Environmental Assessment, prepared by USDA Natural Resources Conservation Service.

2000: Little River Salt Marsh Restoration Project: The first culvert to restore tidal flow to the marsh was installed in 1999 under Appledore Road, and the second culvert at the north end of the marsh was installed under Route 1A in 2000.

2001: North Hampton *forever* Subcommittee established with a $4 million dollar bond initiative: 656 acres of land were conserved within the of the Winnicut River and Little River watersheds.

2002: Creation of *Saving Special Places: Community Funding for Land Conservation* by Brian Hart, Society for the Protection of New Hampshire Forests, and Dorothy Tripp Taylor, Center for Land Conservation Assistance - features the North Hampton *forever* "grassroots organizing" land conservation chapter.

2003: Buffer Zone Requirements Adjacent to Wetlands:
Zoning Ordinance Section 501.6 (Updated in 2005, 2017).

2005: Floodplain Development Ordinance:
Zoning Ordinance Section 504.3.

2006: Aquifer Protection District Ordinance:
Zoning Ordinance Section 503.1.

2006: Chapel Brook Special Study conducted by NH DES Beach Program.

At a Glance Conservation and Water Resource Protection Initiatives

2007: Conservation Audit and Stewardship Plan prepared by Christopher Kane.

2008: New Hampshire Estuaries Project: *A Citizen's Guide to Protecting North Hampton's Wetlands and Water Resources.*

2008: Conservation Subdivision Design:
Zoning Ordinance Section 603.

2009: Little River Salt Marsh Restoration Project Phase II: Improve drainage and tidal connectivity in western section of the marsh and Garland Brook.

2009: Conservation Land District:
Zoning Ordinance Section 201.1 (Updated in 2020).

2010: NH DES 319 Grants: Awards to improve culverts for streams located on North Road, Route 1A, and Little River on Woodland Road.

2011: Agriculture Section of Zoning Ordinance: Purpose of this section is to promote agricultural activities in Town, while ensuring that these activities are suitable for the context in which they occur.
Zoning Ordinance Section 602.1.

2011: Little River Watershed Based Plan, prepared by F.B. Environmental Associates.

2011: Water Quality Testing through 2019: This testing has resulted in work to replace culverts and failing septic systems.

2013: Governor Dale Farm Conservation Easement: Conserved 53 acres; funding sources include Farm and Ranch Land Protection Grant, North Hampton Conservation Commission, Southeast Land Trust, and Private donations from North Hampton residents and other donors.

2013: Conservation Land Trail Map Brochure posted on town website.

2015: Prohibited Uses in the Wetlands Conservation District:
Zoning Ordinance Section 501.

2015: Little River stormwater infiltration pad and restored stream buffer with native plantings with funding from a NH DES 319 Water Quality Grant.

2016: New Hampshire Coastal Risk and Hazards Commission: *Preparing New Hampshire for For Projected Storm Surge, Sea-Level Rise, and Extreme Precipitation.*

2017: Little River Watershed Based Management Plan (Updated).

2017: Management Plan for Forest Hills Farm.

2017: Winnicut River Watershed Restoration and Management Plan.

2017: North Hampton Conservation Land Database: This database is available for the public on the town website which provides information for approximately 1793 acres of North Hampton conservation land (Updated in 2018, 2019, 2020).

2018: Philbrick Pond Saltmarsh Drainage Evaluation.

2018: Winnicut River Project: Proposed plans by the North Hampton Capital Improvements Plan Committee to replace and enlarge two culverts and to complete riverbed work to improve water flow and prevent flooding.

2019: Septic System Inventory and Database: To provide the location and age of septic systems to serve as good basis for further water quality sampling within the Winnicut and Little River Watersheds to help safeguard the Town's water resources.

2020: Coastal Hazards Adaptation Chapter of the Master Plan: (To be complete in 2022).

2022: Phase I: Philbrick Pond Cobble Weir Replacement to improve the health of the marsh by increasing the tidal range approximately 12-inches.

2021: Phase II: Proposal and plans to further restore Philbrick Pond Salt Marsh.

Winnicut River, New Hampshire Rivers Council 2016

Land Use in North Hampton

North Hampton is faced with the challenge of finding a balance between development and the protection of the significant natural resources in the community. The semi-rural and historic character of North Hampton in combination with wetlands, coastal resources, rivers, ponds, forests, and farms provides a high quality of life for residents and an excellent habitat for native plants and animals.

Many communities, including the residents of North Hampton, have acknowledged the impacts posed by development and the need to conserve land for open space, food supply, recreation, wildlife habitat, and the protection of surface and groundwater quality and quantity. One example of this acknowledgement can be found in the **North Hampton Master Plan**, which includes the following statement:

> *"***Clean water and air, open space, biological diversity and a rural New England seacoast character and heritage are a few of cherished values urban growth threatens. Community surveys conducted by Planning Board in 1998, 2005, and 2010 have repeatedly and emphatically made clear that residents of North Hampton value the environment, natural resources, and open space. Overwhelmingly residents have supported initiatives permanently to conserve open space and to protect natural resources such as wetlands, aquifers, forests, wildlife, and farmland.**"

Residents further reiterated how important natural resources are to the community:

> "**Too often, people consider open space merely to be land not currently being used for economic development. The values of open space are often overlooked. Undeveloped land provides many benefits:**

1. **Recreation;**
2. **Buffer areas between development;**
3. **Screening that hides unsightly features;**
4. **Pleasant scenery, visual relief, maintenance of rural character;**
5. **Food production;**
6. **Wildlife habitat;**
7. **Soil and other natural resource conservation;**
8. **Air purification and production of oxygen;**
9. **Water retention, purification, and recharge; &**
10. **Flood control.**

North Hampton Overview, 1742 - Present Times "

"… Natural Beauty Thrives In North Hampton."

The Town of North Hampton is located in Rockingham County and encompasses 8,923 acres of land (approximately 14 square miles) and 55 acres of open water. North Hampton is predominantly drained by two main watersheds: the Winnicut River watershed that drains into the larger Great Bay-Piscataqua River watershed, and the coastal drainage to the Atlantic Ocean via the Little River, Philbrick's Pond, Berry's Brook and Bailey's Brook.

North Hampton was originally considered part of the Town of Hampton as one of the four original towns in the state. Known as the North Hill Parish of Hampton until the New Hampshire General Court granted the incorporation of the Town of North Hampton on November 30, 1742.

The Village District of Little Boar's Head was formed by an Act of the New Hampshire Legislature in 1905. It encompasses the seaward portion of the Town of North Hampton, New Hampshire. The Village District Zoning Ordinance was last updated in 2018.

The road network connected North Hampton's main population areas near the Town Hall, Union Chapel, Christian Church, Centennial Hall, Mill Dam, and the fish houses to adjacent towns. Rail lines running north-south from Boston to Portsmouth and Portland, Maine contributed to development patterns, with rail service beginning in 1840.

The original Europeans settlers of North Hampton cleared areas of forest for timber and to establish agricultural fields. Due to North Hampton's good soils and easy access to the coastal resources, agriculture and fishing remained the main industry in the town through the nineteenth century.

North Hampton is a community which has retained significant rural characteristics which residents consider important for the town. It's land use pattern has largely been determined by its natural resources, which in turn influenced its transportation and commerce development.

Like many New England towns, North Hampton developed areas adjacent to freshwater and coastal waterways with major town facilities located near adjacent uplands; however, years ago before the significance of preserving wetlands was understood, areas of the Town were filled for development.

Today North Hampton is segmented into three zoning districts to include an Industrial-Business-Residential District, a R-1 High Density District, and a R-2 Medium Density District. Fortunately, large areas of pristine land have been preserved for wildlife habitat and public recreation.

As stated in the *2008 Citizen's Guide to Protecting North Hampton's Wetlands and Water Resources :* "Unlike the bustling urban landscape of Boston, North Hampton residents can still be inspired by daily wildlife sightings. Early in the morning great blue herons and snowy egrets fish in the Little River salt marsh, colorful dragonflies dance across the blue sky, and river otters play in secluded ponds.

Some of the best natural beauty that New England has to offer thrives in North Hampton."

Land Conservation Plan for New Hampshire's Coastal Waters

In 2016 The Nature Conservancy (TNC) created land conservation maps to identify areas that provide the greatest benefits to protect coastal water resources.

The Nature Conservancy identified opportunity areas targeted specifically to address threats associated with existing and future development.

Map 1: Buffers for Water Quality Protection:

Pollutant Attenuation and Removal — Riparian buffers that intercept stormwater runoff and at the same time maintain natural cover adjacent to surface waters, and riparian wetlands that are highly efficient at treating pollutants already in surface waters.

Map 2: Public Water Supply, Flood Risk Reduction, Pollutant Attenuation:

Public Water Supply — Lands that safeguard surface and groundwater resources for human consumption.

Map 3: Flood Risk Reduction Opportunity Areas:

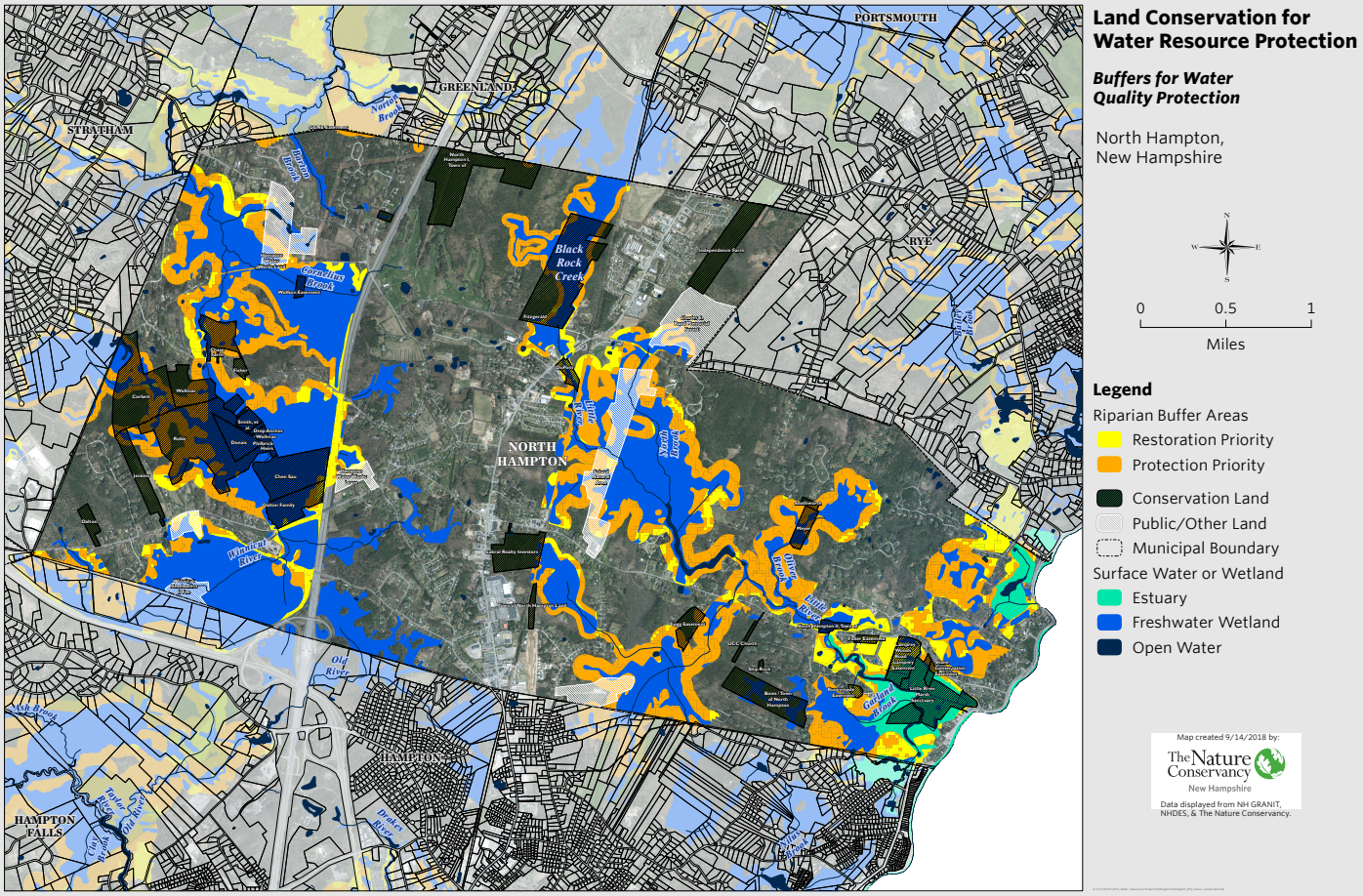
Flood Storage and Risk Mitigation — Areas across the watershed with high flood storage capacities that reduce flood risks to downstream infrastructure, and natural areas that accommodate sea level rise and salt marsh migration.

Decline in water quality and land development are linked as increased development increases pollution and flood risks, while the loss of natural areas decreases the capacity of natural ecosystem services (water purification, flood water retention, and groundwater recharge). When combined with the effects of climate change, the effects of development on water quality are amplified.

Wetland Buffers
Lesson the Impacts of Flooding
NH Estuaries Project

Wetlands buffers are Nature's water treatment plants. They clean surface water of pollutants, like nitrogen and sediments, before they enter a wetland and even the groundwater that provides North Hampton's drinking water.

MAP 1: Buffers for Water Quality Protection

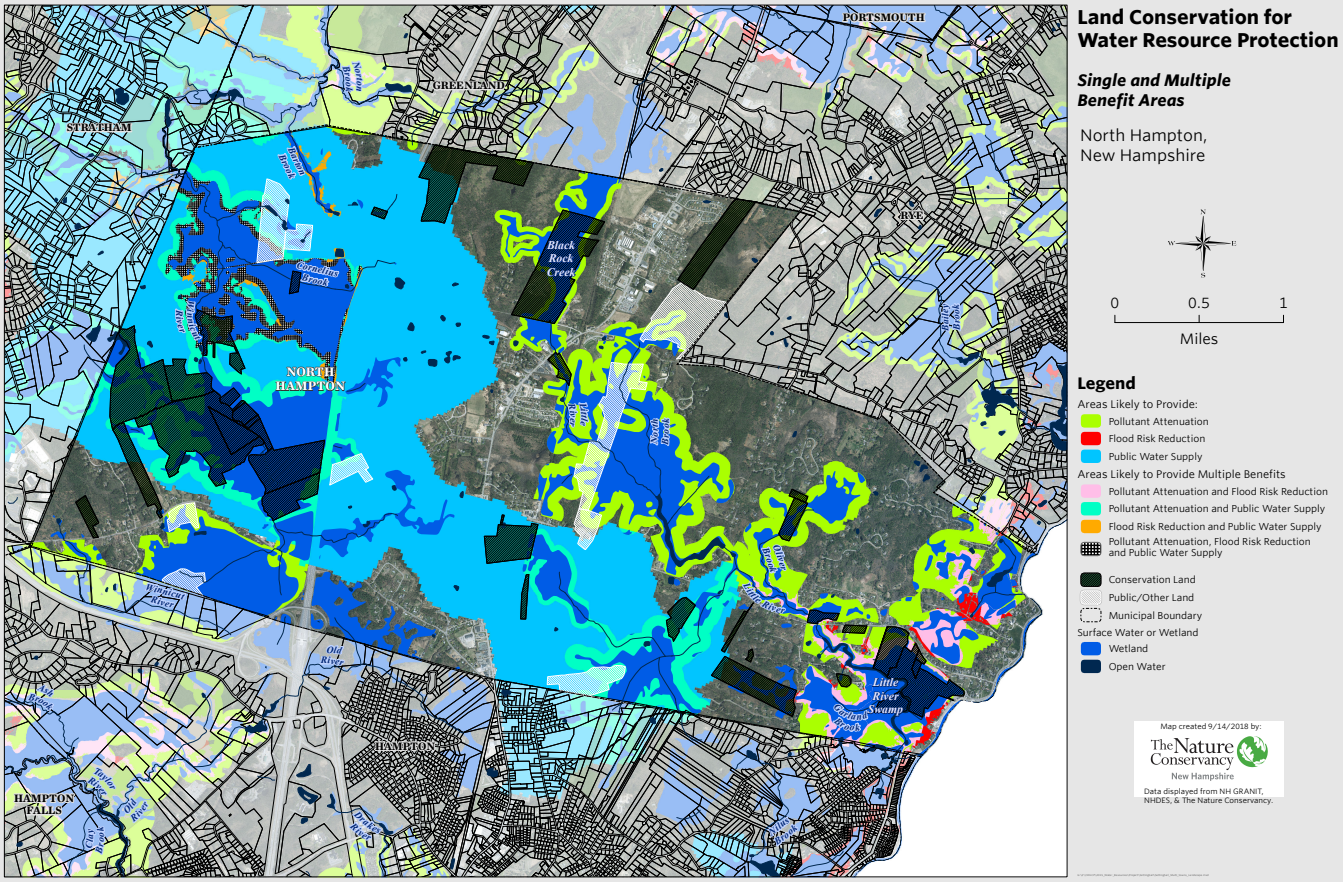


Note: This map does not depict all conserved parcels in North Hampton. For the most up-to-date information please refer to the Town map of conservation parcels on the Town website: https://www.northhampton-nh.gov.

A wetland buffer has lush plant growth and it is this plant growth that makes a wetland buffer act like a sponge.

The roots of plants create tiny spaces in the soil that look like the holes in a sponge. These spaces enable wetland buffers to absorb water very well. As rainwater flows toward a wetland, the porous soil grabs the water. Plant roots absorb some of it, but the rest seeps deeper and eventually enters the groundwater that North Hampton residents rely on for drinking water. And like any good sponge, a wetland buffer cleans the water it absorbs. **Rainwater and stormwater runoff that is laden with pollutants is purified when it flows through a well-vegetated wetland buffer.** — *New Hampshire Estuaries Project: A Citizen's Guide to Protecting North Hampton's Wetlands and Water Resources*

MAP 2: Public Water Supply, Flood Risk Reduction, and Pollutant Attenuation



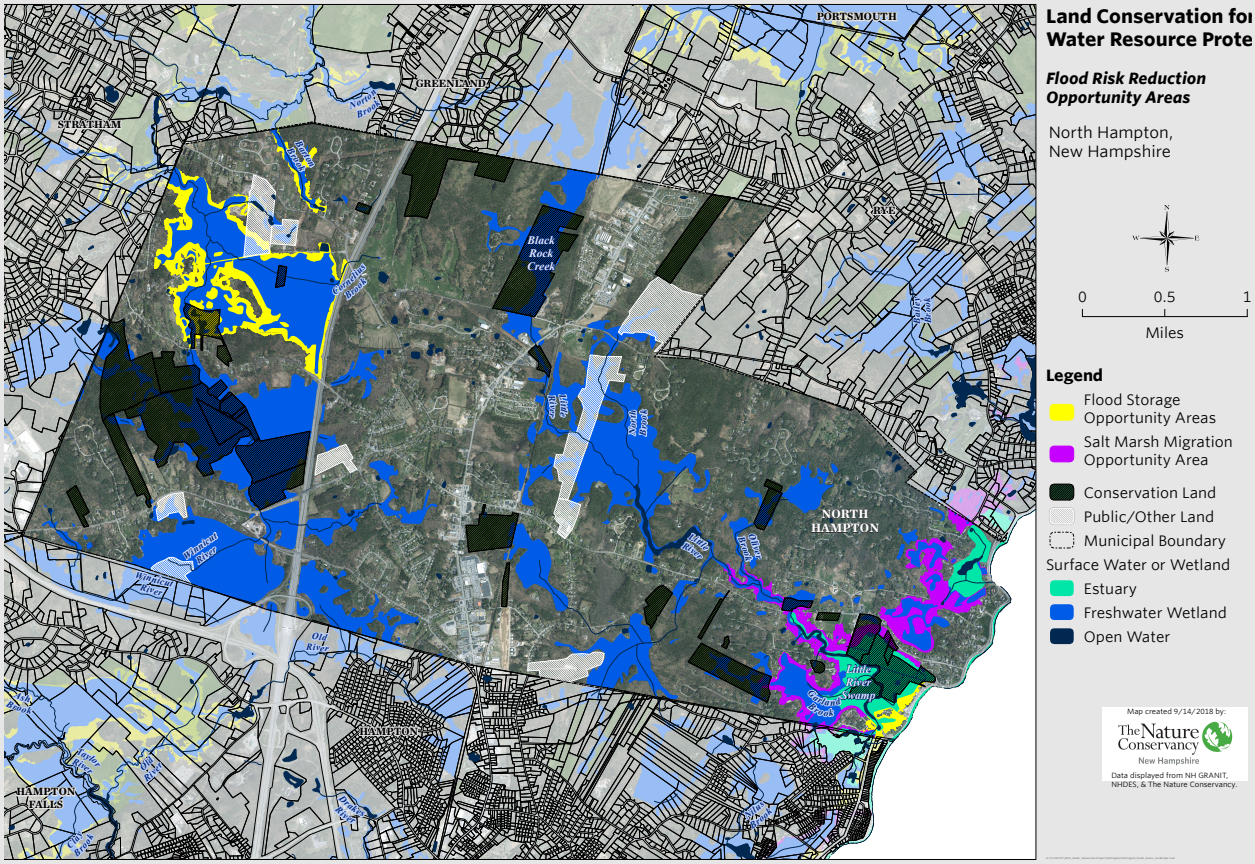
Section 501 Wetlands Conservation District: To guide the use of areas with extended periods of high water tables and buffer zones around wetlands.

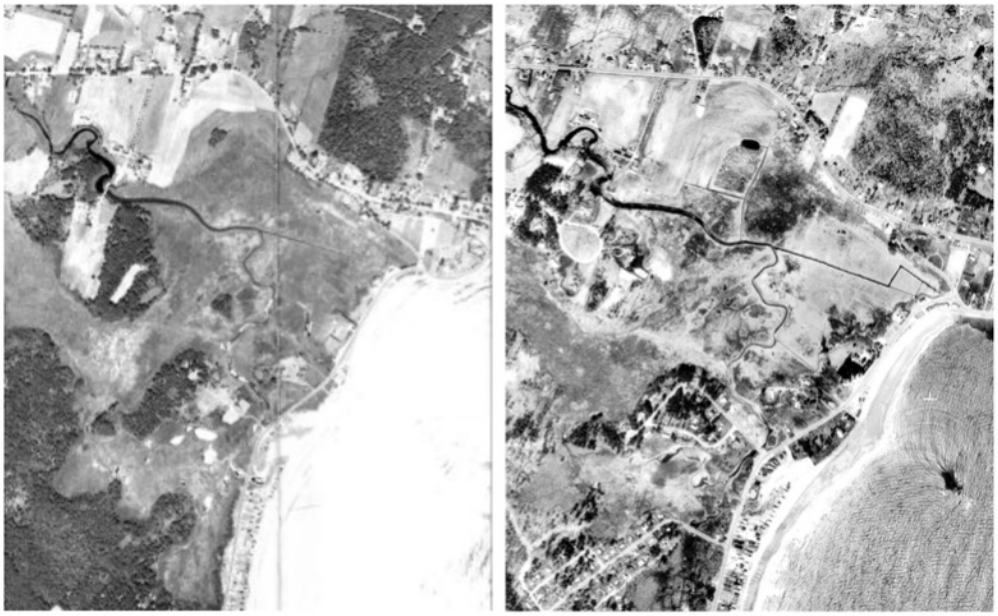
Section 502 Water Resources Protection: To protect the quality of all water supplies, especially on or near known aquifers and primary recharge areas.

Section 503 Aquifer Protection District: Pursuant to RSA 674:16-21, the Town of North Hampton adopted an Aquifer Protection District and accompanying regulations in order to protect, preserve, and maintain potential groundwater supplies and related groundwater recharge areas identified by the Town. The objectives of the Aquifer Protection District are:

A. To protect the public health and general welfare of the citizens of North Hampton.
B. To prevent development and land use practices that would contaminate or reduce the recharge to the identified aquifers and all inter-related waters in town.
C. To assure the availability of public and private water supplies for the present and the future growth of the Town in accordance with the Master Plan
D. To encourage uses that can appropriately and safely be located in the aquifer recharge areas.
E. To heighten awareness of the need for annual review of the Coakley Landfill Site monitoring wells and the testing of residential wells.

MAP 3: Flood Risk Reduction Opportunity Areas





Little River Salt Marsh
USDA
Natural Resource Conservation Service (NRCS)
Durham, New Hampshire
July 8, 1999

Figure 1: Aerial photographs of the Little River Salt Marsh in 1942 (left) and 1992 (right). Note the development around the marsh in 1992 as well as the construction on Huckleberry Lane (Hampton) shown in the lower portion of the 1992 photograph.

Impervious Surfaces: Studies conducted in the northeast have documented that by converting as little as 10% of a watershed to impervious surfaces, stream water quality and organisms begin to deteriorate. Above 25% impervious surface, water quality is seriously degraded. Over 90% of the surface water pollution in New Hampshire is attributable to stormwater runoff (NH Department of Environmental Services. 2014) **As of 2015, 15.3% of North Hampton's land area is impervious** *(UNH Complex Systems Research Center)*. See Map 6 for the location of Impervious surfaces in North Hampton.

Figure 2: Impervious Surfaces 2010 — New Method (Emps 2010 refers to # of employees) 2010 Population Correction: Exeter-14,300; Hampton-15,430; Portsmouth-20,770

	A	B	C	D	E	F	G	H	I	J	K
1	NAME	Pop Census 1990	Pop Census 2000	Pop Census 2010	Emps_2010	Total Square Miles of Town	Total Acres of Town	Total Arce of Non-water	Acres of Conservation Land	Acres Impervious of only Land (2010 New Method)	Pct Impervious of only Land (2010 New Method)
2	Atkinson	5188	6178	6751	957	11.3	7,258.5	7,133.3	1,443.8	613.5	8.6
3	Brentwood	2,590	3,197	4,486	1,963	17.0	10,863.0	10,726.1	2,955.5	611.4	5.7
4	Danville	2,534	4,023	4,387	178	11.8	7,569.4	7,500.4	680.7	375.0	5.0
5	East Kingston	1,352	1,784	2,357	214	10.0	6,380.8	6,398.9	999.1	256.0	4.0
6	Epping	5,162	5,476	6,411	2,311	26.2	16,775.7	16,650.3	3,361.5	865.8	5.2
7	Exeter	12,481	14,058	1,430	9,203	20.0	12,812.9	12,517.4	4,257.2	1,151.6	9.2
8	Fremont	2,576	3,510	4,283	446	17.4	11,142.4	10,948.2	1,007.4	394.1	3.6
9	Greenland	2,768	3,208	3,549	1,993	13.3	8,523.9	6,669.6	1,438.6	553.6	8.3
10	Hampstead	6,732	8,297	8,523	2,297	14.1	9,014.1	8,513.8	1,598.9	800.3	9.4
11	Hampton	12,278	14,937	1,543	6,337	14.2	9,072.8	8,257.7	910.2	1,313.0	15.9
12	Hampton Falls	1,503	1,880	2,236	357	12.6	8,078.0	7,802.2	1,168.4	374.5	4.8
13	Kensington	1,631	1,893	2,124	239	12.0	7,667.8	7,643.3	1,779.5	267.5	3.5
14	Kingston	5,591	5,862	6,025	1,375	21.0	13,450.3	12,577.9	2,601.7	729.5	5.8
15	New Castle	840	1,010	968	380	2.1	1,347.6	528.1	110.6	90.8	17.2
16	Newfields	888	1,551	1,680	619	7.3	4,646.7	4,541.0	1,281.8	199.8	4.4
17	Newington	990	775	753	5,429	12.4	7,916.8	5,242.5	1,343.4	849.3	16.2
18	Newton	3473	4289	4603	427	9.9	6,364.9	6,341.1	787.7	393.1	6.2
19	North Hampton	3,637	4,259	4,301	2,380	13.9	8,922.8	8,904.9	1,769.4	1,362.4	**15.3**
20	Plaistow	7316	7747	7609	4074	10.6	6,789.6	6,802.6	940.1	775.5	11.4
21	Portsmouth	25,925	20,784	2,077	27,420	16.8	10,763.4	10,006.2	1,434.6	2,641.6	26.4
22	Rye	4,612	5,182	5,298	1,482	13.1	8,405.9	8,073.5	1,681.0	605.5	7.5
23	Salem	25746	28112	28776	19834	25.9	16,569.4	15,821.1	1,473.3	2,578.8	16.3
24	Sandown	4,060	5,143	5,986	273	14.4	9,231.8	8,928.2	1,064.8	446.4	5.0
25	Seabrook	6,503	7,934	8,693	5,737	9.6	6,161.3	5,693.7	531.0	1,047.6	18.4
26	South Hampton	740	844	814	107	8.0	5,146.6	5,047.1	392.4	136.3	2.7
27	Stratham	4,955	6,355	7,255	3,535	15.5	9,901.6	9,664.7	1,757.9	831.2	8.6
28	Total	########	########	########	99,567	360.6	230,778.0	218,933.8	38,770.6	20,264.3	9.3

Non-point Source Pollution: When a watershed is increasingly covered with pavement, buildings, and other compacted surfaces that are impervious to water, significant changes in water quality and quantity result. When rain falls on impervious surfaces, it runs off faster into surface waters, carrying with it sediment and pollutants from road surfaces, lawns, construction sites, and parking lots. Flooding, warming water temperatures, and channelization of streams are the result. Infiltration of rainfall into the ground to replenish groundwater is reduced, reducing the quantity of groundwater available for withdrawals for drinking water.

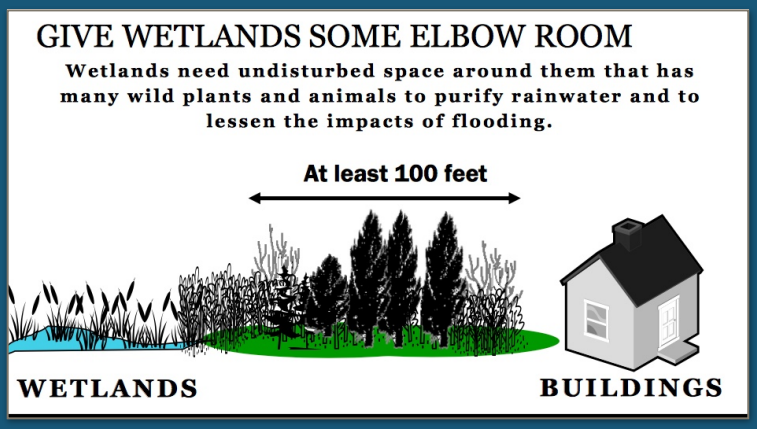
Impervious Surfaces

Figure 3: Impervious Surfaces 2010 — Old Method (The **old method** identified parcels by land use and assigned a percentage of impervious surface based on each photo's pixels based on land use. The **new method** actually delineates impervious surfaces as buildings, roads, driveways houses, etc. The definition of "impervious" is the same for both methods and includes roofs, pavement, and gravel/hardpack areas. For natural impervious surfaces such as ledge, the new method captures large rock/ledge areas; the old method would have assigned a higher percentage of imperviousness to a pixel that indicated areas of ledge.)

	A	L	M	N	O	P	Q	R	S	T
1	NAME	Acres Impervious of only Land (1990 Old Method)	Pct Impervious of only Land (1990 Old Method)	Acres Impervious of only Land (2000 Old Method)	Pct Impervious of only Land (2000 Old Method)	Acres Impervious of only Land (2005 Old Method)	Pct Impervious of only Land (2005 Old Method)	Acres Impervious of only Land (2010 Old Method)	Pct Impervious of only Land (2010 Old Method)	Diff from Old Method 2010 to New Method 2010
2	Atkinson	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Brentwood	1,273.0	11.9	1,843.4	17.2	1,999.0	18.6	2,503.7	23.34	17.64
4	Danville	739.3	9.9	1,111.8	14.8	1,143.3	15.2	1,564.6	20.86	15.86
5	East Kingston	599.9	9.4	829.0	13.0	898.7	14.0	1,143.9	17.88	13.88
6	Epping	1,735.6	10.4	2,497.1	15.0	2,580.0	15.5	3,343.4	20.08	14.88
7	Exeter	2,178.2	17.4	2,987.5	23.9	3,036.8	24.3	3,678.8	29.39	20.19
8	Fremont	892.5	8.2	1,297.5	11.9	1,365.7	12.5	1,849.8	16.90	13.30
9	Greenland	1,045.7	15.7	1,505.6	22.6	1,584.6	23.8	1,924.7	28.86	20.56
10	Hampstead	1,682.9	19.8	2,320.2	27.3	2,388.4	28.1	3,023.9	35.52	26.12
11	Hampton	2,500.1	30.3	3,187.7	38.6	3,269.0	39.6	3,728.8	45.16	29.26
12	Hampton Falls	827.2	10.6	1,187.0	15.2	1,322.1	16.9	1,694.8	21.72	16.92
13	Kensington	693.8	9.1	980.4	12.8	1,022.8	13.4	1,298.8	16.99	13.49
14	Kingston	1,658.3	13.2	2,328.4	18.5	2,372.2	18.9	3,036.4	24.14	18.34
15	New Castle	240.4	45.5	312.5	59.2	313.4	59.3	376.0	71.21	54.01
16	Newfields	358.9	7.9	565.8	12.5	617.9	13.6	785.8	17.31	12.91
17	Newington	1,445.7	27.6	1,887.3	36.0	1,798.3	34.3	2,079.1	39.66	23.46
18	Newton	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19	North Hampton	1,482.4	16.6	2,032.2	22.8	2,103.6	23.6	2,512.3	**28.21**	12.91
20	Plaistow	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21	Portsmouth	4,226.8	42.2	5,217.3	52.1	5,244.5	52.4	5,754.9	57.51	31.11
22	Rye	1,442.8	17.9	1,956.9	24.2	1,970.0	24.4	2,346.1	29.06	21.56
23	Salem	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24	Sandown	1,023.5	11.5	1,447.4	16.2	1,523.8	17.1	2,062.1	23.10	18.10
25	Seabrook	1,538.9	27.0	2,156.7	37.9	2,428.6	42.7	2,774.3	48.73	30.33
26	South Hampton	375.6	7.4	526.9	10.4	525.3	10.4	658.3	13.04	10.34
27	Stratham	1,579.4	16.3	2,236.5	23.1	2,430.0	25.1	3,025.1	31.30	22.70
28	Total	29,541.0	13.5	40,415.2	18.5	41,938.1	19.2	51,165.8	23.4	14.1

Non-point source pollution is now the most serious threat to water quality for New Hampshire and for North Hampton. Low impact construction and site designs that promote retention and infiltration of rainwater and runoff, narrower streets and driveways when possible, shrub and tree buffers to waterways, and development patterns can protect North Hampton's water quality and quantity as the town grows.

North Hampton's **Conservation Subdivision Section 603** regulations encourage protection of wetlands, floodplains, surface area waters, and



Impervious Surface Chart
Data provided by
UNH Complex Systems

NH Estuaries Project,
A Citizen's Guide to
Protecting North Hampton's
Wetlands and Water Resources

Section 603 Conservation Subdivision Design — *Encourages the preservation of open space and other natural resources including water bodies, wetlands, and historical and archeological resource.*

In summary, North Hampton Zoning Ordinance Section 603 Conservation Subdivision design states that the purpose of the ordinance is to permit the implementation of innovative land use controls that preserve North Hampton's rural character and environmentally sensitive elements. This ordinance will help reduce sprawl; the number of buildable lots and maximum density shall not shall not exceed the density for a conventional subdivision permitted in the underlying zoning district. A minimum of 50% of the Buildable Area of the Parent Lot shall be included as Conservation Open Space.

Future Conservation Subdivisions will help sustain the scenic quality and visual character of the town and provide for flexibility, creativity, and efficiency in the location and design of residential development, roads, facilities, and infrastructure.

The Conservation Subdivision design aims to enhance the quality of life by increasing open space and the public's access to land for walking and aesthetic enjoyment and promote a natural system of storm water management to minimize erosion and encourage aquifer recharge.

Figure 2: North Hampton Land Use 1962-2015 *(NH GRANIT, University of NH Complex Systems Research Center)* illustrates how land use in North Hampton has changed in the recent past. The general trend has been for an increase in residential, commercial and transportation uses, with a steady decline of agriculture and forested areas as more land us used for development.

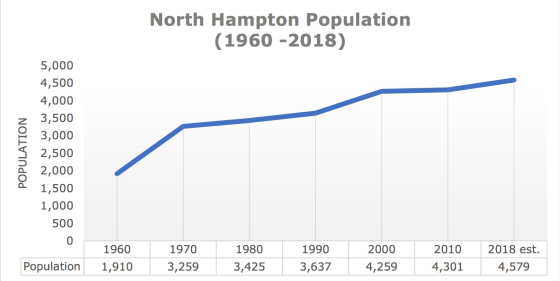
Figure 4: North Hampton Historical Land Use (Acres)

Land Use Type	1962	1974	1998	2005	2010	2015	2010 to 2015 Total Change	2010 to 2015 Percent Change
Active Agricultural	1,323.5	797.5	400.8	236.5	233.6	239.8	6.2	2.7%
Aux Transportation				58.6	58.6	58.0	-0.6	-1.0%
Farmsteads	19.2	18.0	4.5	7.3	12.4	8.8	-3.6	-29.0%
Forested	5,590.7	5,539.7	5,438.2	3,032.1	3,009.7	2,964.1	-45.6	-1.5%
Industrial/ Commercial	83.4	160.3	251.8	280.6	281.8	289.1	7.3	2.6%
Mixed Urban	114.1	150.3	201.4	13.9	13.9	13.9	0.0	0.0%
Open Wetlands	434.7	433.2	543.4	2,487.0	2,486.2	2,484.6	-1.6	-0.1%
Other/Idle	505.5	756.7	465.2	651.8	646.0	619.3	-26.7	-4.1%
Playing fields/ Recreation				194.1	190.0	183.0	-7.0	-3.7%
Railroad				8.9	8.9	8.9	0.0	0.0%
Residential	676.0	864.5	1,387.6	1,581.9	1,611.8	1,666.1	54.3	3.4%
Transportation	141.5	160.8	178.5	239.8	239.8	256.7	16.9	7.0%
Utilities				74.6	74.6	74.8	0.2	0.3%
Water	34.2	42.0	51.3	55.6	55.6	55.6	0.0	0.0%
				TOTAL ACREAGE		8,922.7		

Note: Years 1962, 1974, and 1998 were compiled with a slightly different methodology than 2005, 2010, and 2015. Aux Transportation, Playing Fields, and Utilities are categories only broken out in 2005, 2010, and 2015. Classification of wetlands was improved between 1998 and 2005. Due to lesser quality aerial photos many wetlands were classified as 'Forested' before 2005. Many Playing Fields were changed in 2015 to ensure that those in proximity to a school were classified as Education (Industrial/Commercial).

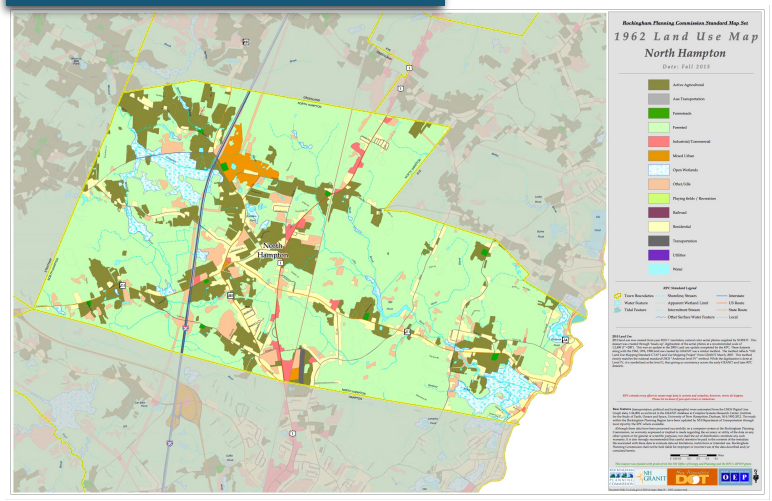
Population — The population of North Hampton has more than doubled since 1960 from 1910 persons to 4579 persons in 2018. Sustainable development is crucial as the Town is faced with the challenge of protecting its significant natural resources.

Figure 5:
North Hampton Population 1960 through 2018;
NH Office of Strategic Initiatives & US Census Bureau

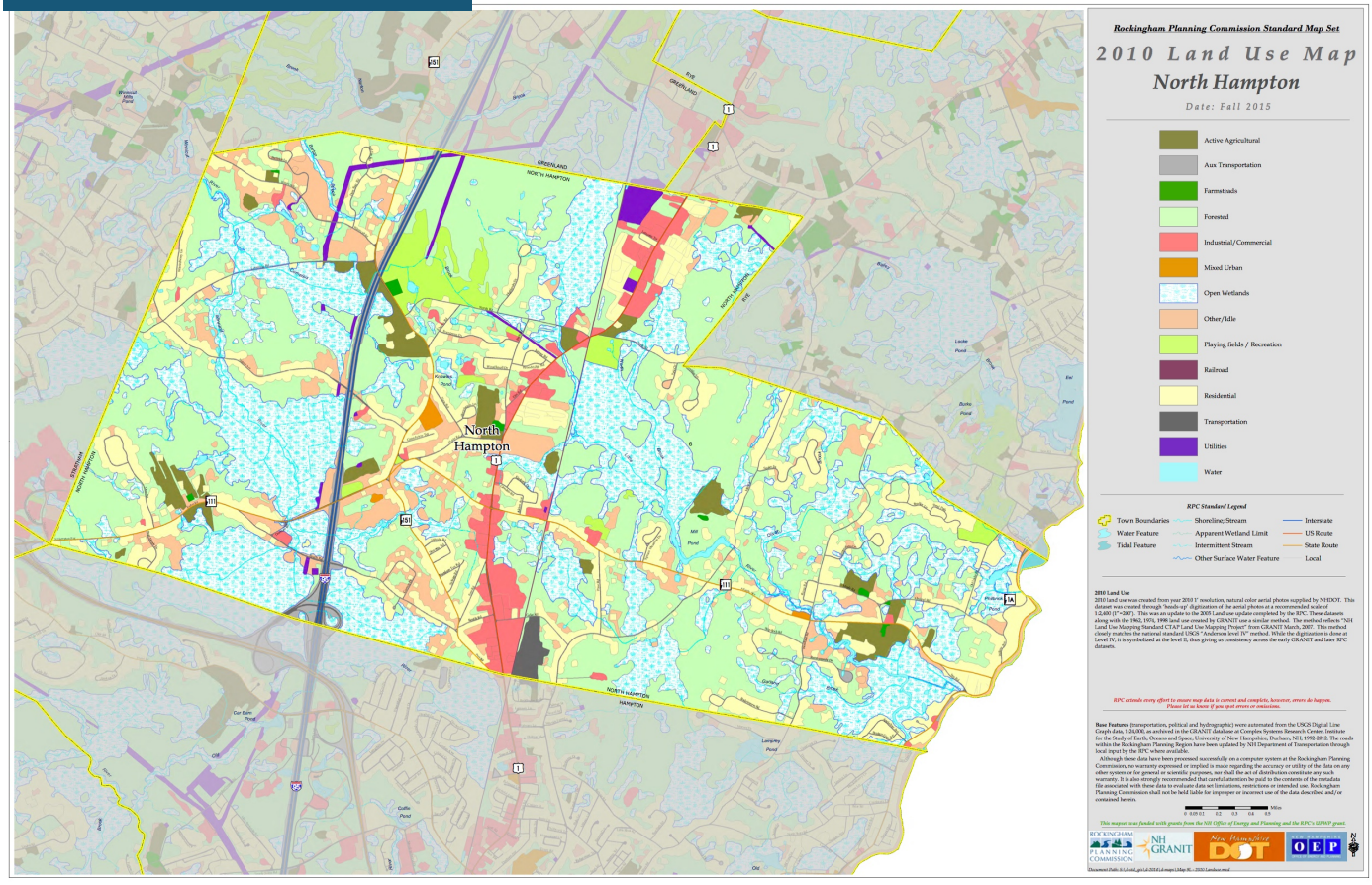


	1960	1970	1980	1990	2000	2010	2018 est.
Population	1,910	3,259	3,425	3,637	4,259	4,301	4,579

Map 4: 1962 Land Use Map



Map 5: 2010 Land Use Map

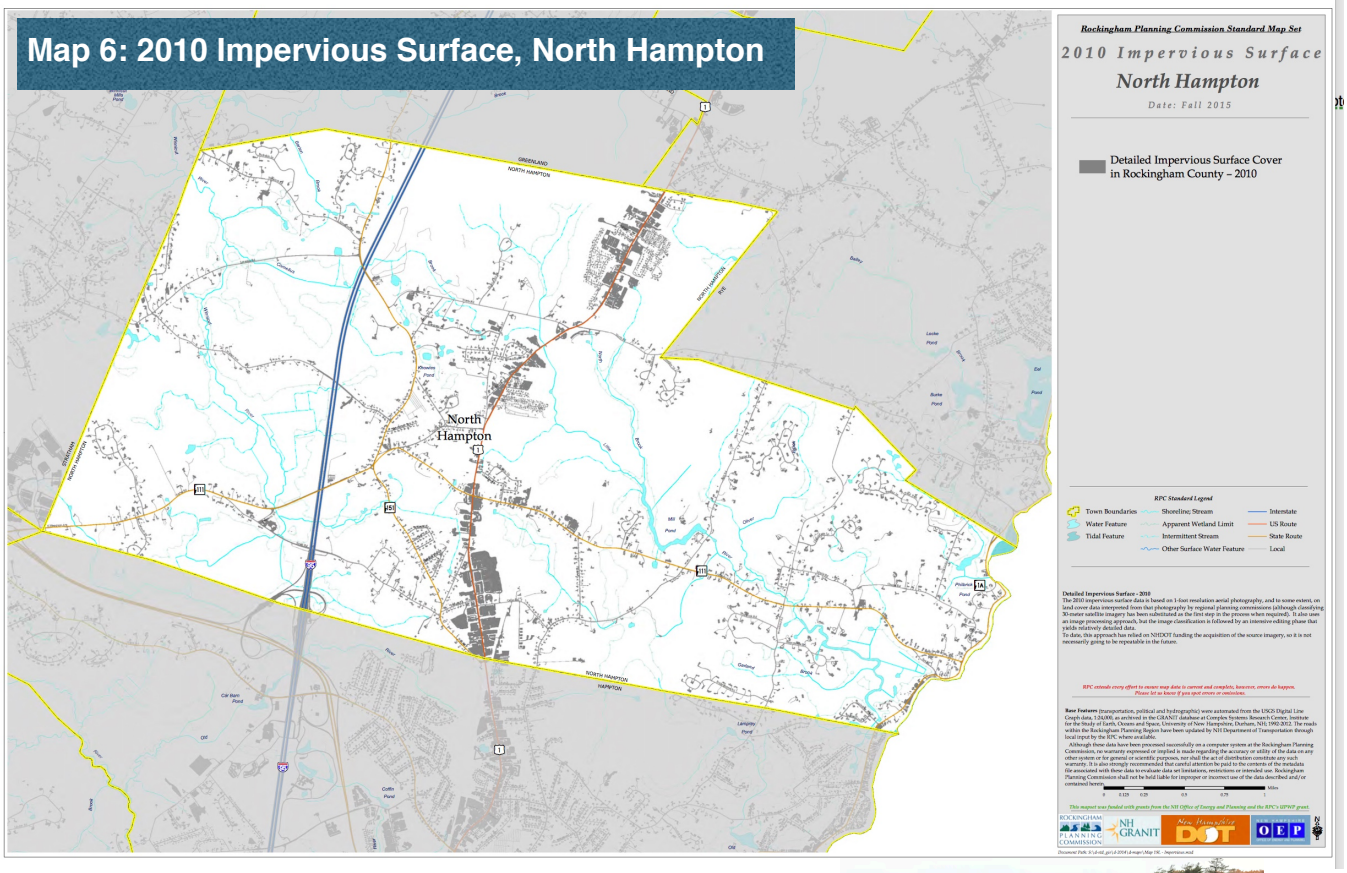


What are Impervious Surfaces?

Impervious surfaces are areas covered by material that impedes the infiltration of water into the soil. Examples of impervious surfaces are buildings, pavement, concrete, and severely compacted soils.

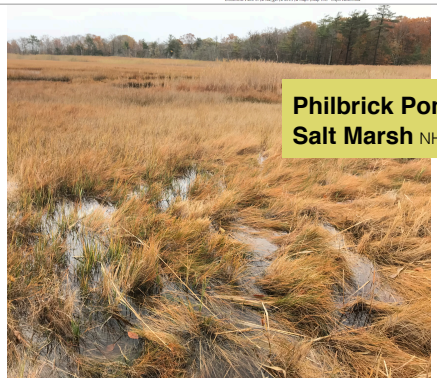
Altering the Natural Flow of Water: The addition of impervious surfaces, especially coupled with urban drainage systems (i.e. curbs, gutters, and storm drain pipes), alters the natural hydrology in a watershed by increasing the volume of stormwater runoff and reducing groundwater recharge. The result is more frequent flooding, higher floods peaks, lower dry weather flow in streams, and lower water tables. *NH Estuaries Project*

Map 6: 2010 Impervious Surface, North Hampton



The New Hampshire Coastal Adaptation Workgroup announced winners of the #KingTideNH2019 Photo Contest. David Murray's "The Canals of Hampton" won in the Most Vulnerable category.

October 2019 King Tide, Hampton: Former marsh land that is now developed periodically floods.



Philbrick Pond Salt Marsh NHCC

October 2019 King Tide, North Hampton: Undeveloped marsh land that serves as surge tank during high tides and storms.

Future Groundwater & Surface Water Availability

Population increases and associated development will continue to increase the use of groundwater and surface water resources for drinking water as well as industrial and other uses. USGS

To gain a better understanding of how much groundwater is available in the region, researchers quantified water storage and water movement in groundwater and surface water systems. The final report, "Assessment of Ground- Water Resources in the Seacoast Region of New Hampshire", states:

Climate change in New England is forecast to include more frequent and intense precipitation events, with a slight decrease to little change in total precipitation, and increasing temperatures. The effects of this potential future climate change on the Seacoast hydrologic system would likely include reduced base flows and fresh ground-water discharges to tidal areas and lowered ground-water levels. The effects of these climate changes by 2025 were estimated to be greater than the potential effects of increased water demands. The analyses indicated that there are potential issues of concern for future use of water resources in the Seacoast region. The models developed and demonstrated in this investigation can provide water-resource managers and planners tools with which to assess future water resources in this region. The findings regarding the effects of increasing water demand and potential climate change on ground-water availability may be transferrable to other regions of the Nation with similar hydrogeologic and climatic characteristics.

Citizens Can Help Protect and Conserve Groundwater —*groundwater.org*

- **Use native plants in landscape.**
- **Dispose of waste properly and use fewer chemicals.**
- **Conserve water:** repair leaks, water plants only when needed during the cooler times of the day, and wash smarter by taking shorter showers and running only full loads in dish and clothes washer.
- **Use natural non-toxic household cleaners whenever possible.** Baking soda, vinegar, lemon juice, olive oil, and castile soap.
- **Reduce, reuse, and recycle**. Reduce the amount of "stuff" used and reuse and recycle.

Future Groundwater & Surface Water Availability

New methods were developed to estimate water use in 2003 and future water demand in 2017 and 2025 in the Seacoast region in southeastern New Hampshire, which has experienced a 37-percent population increase during 1980 to 2000. Water-use activities for which estimates were developed include water withdrawal, delivery, demand, consumptive use, release, return flow, and transfer by registered and aggregated unregistered (less than 20,000 gallons per day (gal/d)) users at the census-block and town scales. (Excerpt from USGS Scientific Investigative Report 2007-2017 prepared in cooperation with the New Hampshire Department of Environmental Services.)

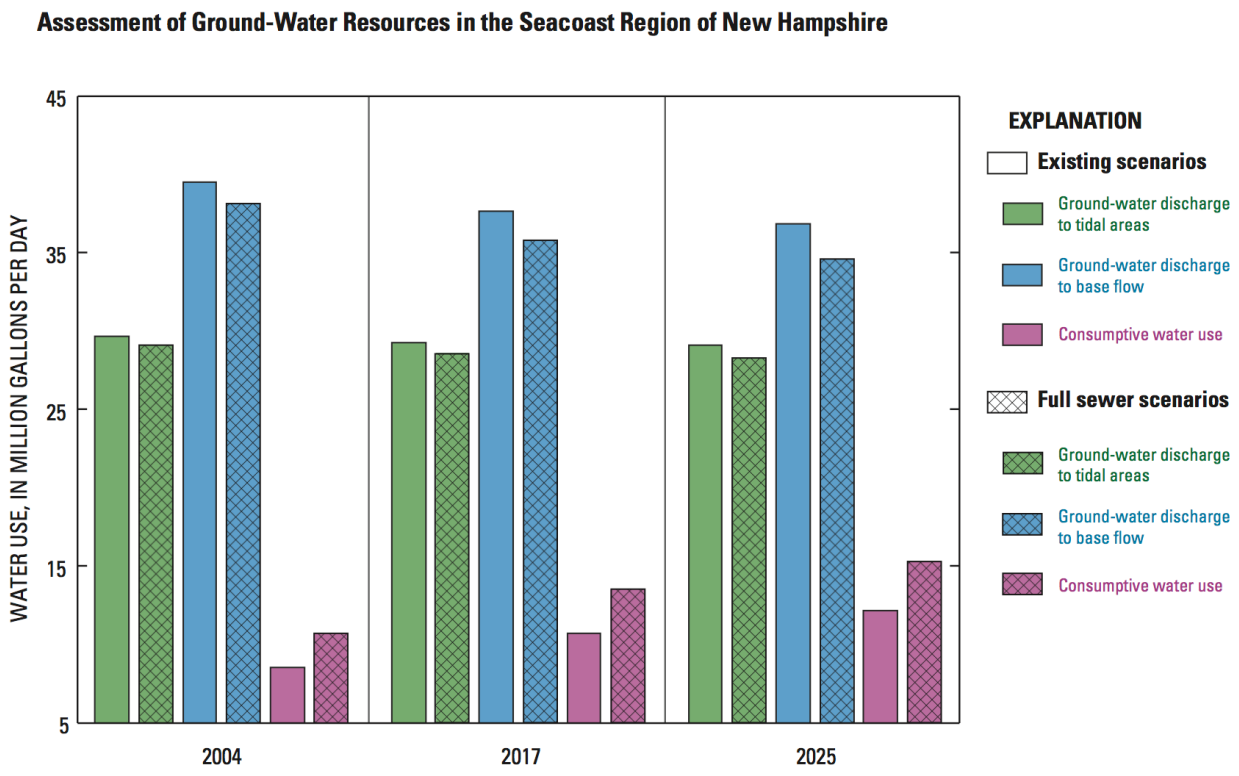


Figure 6: USGS: Assessment of Ground-Water Resources in the Seacoast Region of New Hampshire, U.S. Department of the Interior U.S. Geological Survey, p.36. Simulated current (2004) and future (2017and 2025) ground-water discharge and consumptive use for the Seacoast model area, southeastern New Hampshire.

Groundwater Contamination & Groundwater Protection Measures

Groundwater quality can be impaired by a variety of materials. Sources of groundwater contamination include landfills, commercial and industrial wastes, agricultural fertilizer, failing septic systems, and road salt. Groundwater quantity can be reduced by contamination of groundwater supplies, over-pumping in the aquifer zone, and increasing impervious surfaces such as roof tops, roads, and parking lots. These surfaces prevent the infiltration of precipitation into the ground.

Public Drinking Well Near Coakely Landfill: The Coakley Landfill, a Federal Superfund Site contaminated by hazardous waste, sits over one of North Hampton's aquifers. A number of years ago Aquarion, then known as Hampton Water Works, drilled and started to establish and permit a public drinking water source well at a location that the Commission and its expert consultants, believed would draw water from the aquifer under Coakley. The North Hampton Water Commission felt that would cause considerable migration of the Coakley contamination, likely making many private wells in the area unusable and making it impossible to predict where contaminants from Coakley would migrate to. The Water Commission became extensively involved in the issue with the New Hampshire Department of Environmental Services (NHDES) and stopped the well from operating. *Tim Harned, North Hampton Water Commissioner*

Groundwater Protection: More than 60 percent of New Hampshire's population relies on groundwater for water supply. Protection of New Hampshire's groundwater is critical to the continued availability of water supplies, to our economic prosperity, and to the quality of surface waters, wetlands, and water-based ecosystems. New Hampshire has achieved significant progress in protecting groundwater over the last decade. Overall, the state's groundwater is of high quality and can provide sufficient quantity for residential, commercial, industrial, agricultural, and recreational needs. However, isolated incidents of contamination or inadequate supply continue to occur.
New Hampshire's groundwater protection goal is to maintain all groundwater in the state at drinking water quality and, where groundwater is discharged naturally to surface waters, to support surface water quality goals. Further, groundwater quantity should be managed to support the public good. New Hampshire's goal for groundwater protection has developed through the passage of both legislation (RSA 485-C:1 and 481:1) and administrative rules (Env-Ws 1500 and Env-Wm 1403). *NH Nonpoint Source Management Plan, 1999*

Properly Maintained Septic Systems Can Recharge the Aquifer

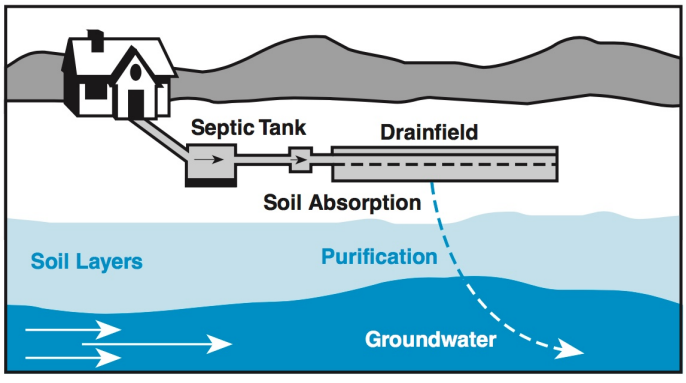
"Decentralized wastewater treatment can meet the triple bottom line of protecting the environment, being efficient, and contributing to community well-being by:

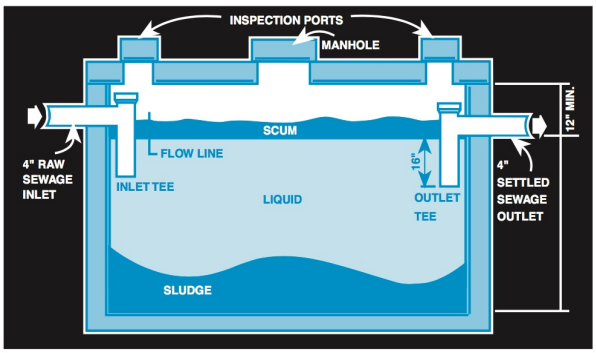
- ***Increasing water quality and availability,***
- ***Responding to growth while preserving green space, and***
- ***Using the natural treatment properties of the soil."***

— The EPA Decentralized Wastewater Memorandum of Understanding (MOU) Partnership

- The EPA Memorandum states that: "decentralized wastewater treatment effectively and efficiently treats domestic sewage to protect water quality and support local water supplies.
- The waste water from decentralized systems stays in the local watershed as it returns to the drain field, dispersing into the underlying soil and eventually recharging groundwater and/or reentering the local watershed.
- Most decentralized systems take advantage of gravity flow rather than using energy to pump the wastewater.
- Decentralized systems can be designed to meet specific growth goals through planning where and how the community will grow.
- Decentralized systems provide good opportunities to use the natural environment. They can help reduce the level of difficulty and cost to treat pollutants, such as nutrients, and keeping them from entering rivers lakes, rivers, and streams. The soil acts as a natural filter and provides final treatment by removing harmful bacteria, viruses, and nutrients."

How Septic Systems Work





Pipeline — Summer 1995; Vol. 6, No. 3

Properly Maintained Septic Systems Can Benefit the Environment

Septic systems are an integral component of rural communities; centralized sewer systems are necessary for urban development. Both systems can pose dangers to the environment.

Properly maintained septic systems are less harmful to the environment. Waste water from septic systems is returned to watershed and replenishes the aquifer.

Treated wastewater from sewer systems is typically released into the ocean or local water bodies and consume more water than septic systems.

Septic systems provide a long-term and cost effective solution for communities by avoiding the large capital investment and high operating and maintenance costs associated with central sewer systems.

Centralized sewer systems consume more water than septic systems. Treated wastewater from sewer systems is typically released into the ocean or local water bodies. During extreme storm events, centralized systems often overflow and release either partially treated or untreated sewage into streams, rivers, and oceans. ***(In 2013 "11 billion gallons of untreated and partially treated sewage flowed into rivers, bays, canals, and in some cases, city streets, largely as a result of record storm-surge flooding that swamped the region's major sewage treatment facilities."*** *Sewerage Overflows from Hurricane Sandy by Alyson Kenard, PhD., Daniel Yawitz, Urooj Raja www.climatecentral.org**.)***

If not properly maintained, failed septic systems also threaten and can pollute water resources. Septic systems must be inspected and pumped as recommended by the NH DES — every three years or sooner if necessary.
"Decentralized systems typically use small and relatively simple equipment that can be easy and affordable to operate, maintain, and replace. Additionally, because these types of systems treat wastewater close to the source of generation and often use some passive treatment, such as soil dispersal, these systems may offer substantial savings in energy costs."

The EPA Decentralized Wastewater Memorandum of Understanding (MOU)Partnership

Groundwater & Surface Water Protection Recommendations

Educate the public about the importance of recharging the aquifer and protecting valuable water resources and share information about actions that will help achieve these goals.

Use the Natural Resources Inventory, as well as maps and additional up-to-date information, to help boards and commissions better plan for the future.

Raise public awareness to promote voluntary efforts to reduce non-point source pollution from pet waste, fertilizers, pesticides, gasoline, automotive oil, antifreeze, and other wastes. Continue to hold annual household hazardous waste collection program for residents.

Promote proper maintenance of septic systems, encourage regular inspections, and educate the public about how properly maintained septic systems help recharge the aquifer.

Refer to the North Hampton Septic System Inventory to identify environmental risk factors that increase the likelihood of septic system failure based on soils, proximity to surface waters, groundwater intrusion, parcel size and system age.

Support and adopt zoning measures which aim to protect aquifers, wellhead protection areas, wetland buffers.

Incorporate sea level rise into groundwater planning efforts. Adopt recommendations for the siting of drinking water wells and septic system design, placement, and maintenance.

Monitor culvert and stream crossings, update stormwater drainage maps, and investigate sources of possible contamination and pollution.

Continue to educate the public about state and federal efforts to protect drinking water supplies from industrial chemicals.

Encourage the planting of vegetation, trees, and identify and plan for the removal of invasive plants.

Conserve strategically located wetlands and parcels along rivers and streams.

Refer to the following NH DES website to learn more about water quality and protection. https://www.des.nh.gov/water

Enjoy North Hampton's conservation land, trails, open space, and get involved to promote good stewardship of our precious natural resources.